Guidance for Measuring Student MWEE Outcomes

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What is the purpose of this guidance?

As a supporter of Meaningful Watershed Educational Experiences (MWEEs), NOAA B-WET is interested in the effects of these unique educational experiences on students. MWEEs are investigative or project-oriented, an integral part of instruction, consider the watershed as a system, include outdoor field experiences, enhanced by NOAA products, services, or personnel, where appropriate and sustained. For an expanded definition of a MWEE, see the Chesapeake Bay Program Education Workgroup's 2001 definition (undergoing revisions in response to the new 2014 Bay Agreement): http://www.chesapeakebay.net/content/publications/cbp_12136.pdf.

NOAA B-WET funded MWEEs seek to support science learning, increase watershed literacy and foster environmental stewardship. To help B-WET grantees and others assess to what extent MWEEs are achieving these goals, the University of Michigan and eeEvaluations were asked to develop measures for the following potential outcomes:

Science Learning Outcomes

1. Science Inquiry Skills
2. Science Engagement

Environmental Stewardship Outcomes

1. Connection with Nature
2. Connection to Water
3. Water Conservation Behaviors
4. Knowledge of Issues
5. Locus of Control

6. Knowledge of Actions (secondary only)
7. Intention to Act

Watershed Literacy Outcomes

1. Define the term "watershed"
2. Identify local watershed(s)
3. Identify how watersheds are connected to the ocean via streams, rivers, and human-made structures
4. Identify the functions that occur in a watershed (transport, store, and cycle water)
5. Recognize that both natural processes and human activities affect water flow and water quality in watersheds
6. Identify connections between human welfare and water flow and quality
7. Identify possible point and non-point sources of water pollution
8. Identify actions individuals can engage in to protect/restore water quality in watersheds

NOAA B-WET is not currently collecting data from students as part of its National Evaluation System (http://www.oesd.noaa.gov/grants/bwet_eval.php#page=page-1) but is making the measures for the above outcomes available for use when evaluating MWEEs, as appropriate.

This document provides guidance on how to use the measures developed by the University of Michigan and eeEvaluations to assess students' science learning, watershed literacy, and environmental stewardship outcomes. This document does NOT provide guidance on how to measure ALL of the potential MWEE outcomes of your unique project.

What results can be expected from your MWEEs?

You work hard to provide students with exciting, hands-on experiences studying watersheds and bodies of water. But are those experiences making a difference? You want to know, your funders want to know, teachers and school administrators want to know.

Although all MWEEs share common characteristics (see MWEE definition), such as including outdoor learning experiences, there are many different ways to implement MWEEs. For you to best evaluate your project, you need to identify the specific outcomes your project targets and what you want to learn from the evaluation. You do not want to measure an outcome if the project is not designed to achieve it. For example, if the MWEE experience does not include science inquiry, then it probably does not make sense to attempt to assess changes in students' inquiry skills.

One way to visually describe your project and decide which outcomes to evaluate is to create a logic model showing the project's inputs (what goes into the project), outputs (what the students do), and outcomes (the effect on students) and how these are linked. See the example in Figure 2. For more information on how to create a logic model, see http://meera.snre.umich.edu/plan-an-evaluation/step-2-clarify-project-logic.

If your project's outcomes match those listed in the prior section, and if using a questionnaire to collect data is appropriate for your audience and project, then this document can help. Student MWEE outcome measures were created exclusively for questionnaires and designed to be age-appropriate (i.e., for upper elementary grades 4-5 and secondary grades 6-12).

How can you collect data to measure MWEE project results?

There is no one perfect way to collect data to measure MWEE outcomes. Deciding how to collect data depends on what you would like to measure, your audience, and circumstances. Ideally, it is best to use more than one data collection method, such as questionnaires and interviews, to get a holistic view of your project's results. This document provides measures suitable for questionnaires but not other ways of collecting data.

What questionnaire items are available to measure MWEE outcomes?

The University of Michigan and eeEvaluations created a bank of measures that can be included in questionnaires to measure select MWEE outcomes. The measures in this item bank were extensively pilot-tested. Students were first interviewed as they completed the questions to assess readability and clarity. After a round of revisions, additional pilot-data were collected through an on-line questionnaire. Using statistical techniques, measures that did not assess the intended outcomes were eliminated. It is recommended that you do NOT make changes to these measures. If you choose to do so, further pilot-testing will be needed to verify your revised measures' quality.

Attached to the end of this document are the lists of measures you can use in your own MWEE questionnaire. These items measure are provided in three categories: Student Demographics, MWEE Learning Experiences, and MWEE Outcomes (Figure 1). It is important to include measures from the first two categories in addition to the third, so you can explore why your project resulted in the expected outcomes it did, or why it did not.

The item bank's questionnaire measures are grouped in "scales," meaning that they are intended to be used as a group. For example, there are 4 measures in the scale for assessing "connection to water." Scales (i.e., multiple items), rather than single items, are typically needed to accurately measure educational outcomes. So, if you would like to measure your students' connection to water you need to include all 4 of these measures to accurately measure this outcome.

Figure 1: What can you measure through the B-WET MWEE student questionnaire item bank?

Student Demographics	MWEE Learning Experiences	MWEE Outcomes
• Grade • Science Achievement • Race/Ethnicity • Speak English as Second Language • Gender	• Outdoor Learning Experiences • Preparation/Action/Reflection • Student Satisfaction	• Science Inquiry Skills and Engagement • Environmental Stewardship Characteristics • Watershed Literacy

How can I prepare and administer a MWEE questionnaire?

Preferably, students would be asked to complete a nearly-identical questionnaire before (pre-) and after (post-) their MWEE so that changes in outcomes can be assessed. Ideally, students who do not participate in a MWEE should also be asked to complete these questionnaires at the same time as the MWEE students, and their results compared to the MWEE participants' results. This will allow you to say with confidence that changes in MWEE students are due to their participation in MWEEs rather than other events or influences.

Be advised that collecting data from students can require parental/guardian permission, unless the data collection is a part of students' regular curriculum, such as a unit test. For a sample parental consent form, see http://meera.snre.umich.edu/sites/all/files/parental_consent_form_treatment.pdf.

Given that closed-ended questions like the ones in the B-WET MWEE student questionnaire item bank, can limit what you learn about students' experiences, consider including some open-ended questions to see if you can discover something you did not expect. You can include questions such as, "How would you complete this sentence? I never realized that …." or "What were your favorite and worst experiences during the MWEE?" See the sample questionnaire in Appendix A.

Tips for constructing your project's questionnaire:

- Include a code so that individual students' pre- and post-MWEE responses can be matched. This is the only accurate way to assess changes in students.
- Keep the questionnaire's length as short as possible, as appropriate for your students' age. It would be overwhelming to include all of measures in the B-WET MWEE item bank in one questionnaire, even for high school students. Depending on your students and circumstances, you should develop a questionnaire that can be completed in 20 minutes or less.
- Keep the "scale" or group of questions to measure a particular outcome intact. This is the only accurate way to assess that specific outcome.
- Pilot-test the questionnaire you design. Although the measures in the B-WET MWEE student questionnaire item bank have been extensively pilot tested, your students may be different in their reading level, vocabulary, etc. At minimum, the pilot-test will let you know how long students need to complete your questionnaire.
- You will notice that "Not sure" or "I don't know" are provided as response options. These options allow students to answer all questions. Otherwise, when students skip questions, you do not know why they skipped them and cannot include their responses in data analysis.

For additional guidance on questionnaire design, see http://meera.snre.umich.edu/plan-an-evaluation/step-4-choose-design-and-tools.

An example questionnaire

Here is an example of how MWEE providers can use the measures in the B-WET MWEE student questionnaire item bank.

The "Get Wet" MWEE project involves students in preparing for and exploring the water quality of a local creek and in implementing a solution to an environmental problem affecting the creek (

Figure 2). Given this project's expected outcomes, the project managers created a questionnaire using measures from: Student Demographics, MWEE Learning Experiences, and MWEE Outcomes (i.e., the scales for Science Inquiry Skills, Knowledge of Issues, select Watershed Literacy objectives, Knowledge of Actions, and Intention to Act).

Figure 2: The Get Wet Project Logic Model

Inputs	Outputs	Outcomes
• Classroom instructional materials such as topographic maps, online videos, graphing software, etc. • Stream monitoring equipment such as water chemistry kits, kick seines, and field guides	Ninth grade students: • use topographic maps to delineate the watershed of a local creek (Preparation) • watch a video produced by a local watershed organization describing how runoff in the watershed is polluting the creek (Preparation) • walk to the creek and sample macroinvertebrates and test water chemistry (Action/Outdoor Learning) • compare data collected from several groups of students and assess the overall health of the creek • determine at least one runoff pollutant impacting the creek • decide on and implement an action to take to reduce the impact of that pollutant (Action) • reflect on the MWEE experience (Reflection)	Students will be able to: • define and describe a watershed (Watershed Literacy) • describe pollutants that affect that quality of the water in the local creek (Watershed Literacy) • use science skills to collect and analyze data (Science Inquiry Skills) • describe actions individuals and groups can take to protect or restore the local creek (Knowledge of Actions) • express an intention to participate in activities that will help protect or restore the creek and its watershed (Intention to Act)

In what ways can the data be analyzed?

To determine if students changed in their MWEE outcomes, be sure to include only matched pre/post data from individual students in the analysis (i.e., students who responded to both the pre and post MWEE questionnaire and whose answers can be matched based on the questionnaire's student code).

Here are some general steps for this type of analysis:

- Begin by reviewing individually matched (based on code included in questionnaire) students' pre and post MWEE questionnaire responses. If an individual student's response to a question is missing or not in proper format on either the pre- or post-MWEE questionnaire, you cannot use that individual's answer to that particular question as part of subsequent analyses.
- For each scale, calculate the mean pre- and post-MWEE response for that scale. For example, what was the mean of the responses to the four Caring about Water measures (i.e., the mean of

the four respective means)? Next, compare the students' pre- and post-MWEE means for the scale to determine if they are different.

- For the multiple choice items, determine if the response to each question was correct or incorrect and create an overall score for each student based on the number of correct pre- and post-MWEE answers. By assigning 1 to correct responses and 0 to incorrect or "don't know" responses, overall scores are easily calculated. Again, compare students' pre- and post-MWEE means to determine if they are different.

To conclude whether the differences you observe can be considered statistically significant (not only due to chance), you will need a statistical test, the paired t-test. You can either do this analysis on your own, or ask a consultant to assist you. For additional guidance on analyzing data, including software to help you, see: http://meera.snre.umich.edu/plan-an-evaluation/step-6-analyze-data

What resources are available to assist you with your evaluation?

- A sample secondary student questionnaire with select outcome scales and watershed literacy questions (Appendix A)
- The complete B-WET MWEE student questionnaire item bank (Appendix B): (1) upper elementary (grades 4-5) self-reported science learning and environmental stewardship outcomes measures, (2) secondary (grades 6-12) self-reported science learning and environmental stewardship outcome measures, and (3) secondary (grades 6-12) watershed literacy measures (no watershed literacy are available for elementary students)
- My Environmental Education Evaluation Resource Assistant (MEERA): http://meera.snre.umich.edu/
- NOAA Education Evaluation: http://sanctuaries.noaa.gov/education/evaluation/welcome.html
- An additional bank of measures is posted on the Sanctuaries website: http://sanctuaries.noaa.gov/education/pdfs/evalitems.pdf. Remember that not all items are appropriate for your particular MWEE, so first carefully consider what to measure before selecting items from this or any other item bank.
- Guidance on how to find an evaluator can be found at: http://meera.snre.umich.edu/plan-an-evaluation/related-topics/finding-working-with-an-evaluator

Would NOAA B-WET like to see my results?

Yes! When you have results from your evaluation, please send a copy to the B-WET National Coordinator (http://www.oesd.noaa.gov/staff.html).

Appendix A: Sample Secondary Student MWEE Questionnaire

Thank you for filling out this questionnaire! By doing this, you are helping to make education projects better for you and other students.

In this questionnaire, you will be asked what you know about your local watershed and what you can do help protect it.

Please be completely honest when you answer the questions. Your answers to these questions will be kept anonymous (we don't ask for your name) and your answers will not affect your grade. Your teacher and your parents will not read your answers to these questions.

If you do not understand a question, do not mark a response. Leave that question blank and move on to the next one.

Your teacher can help you if you do not understand certain words or any of the directions for completing this questionnaire.

So that your answers on this questionnaire can be matched to response you provide later, please create an ID number.

Your ID number is the two digits that represent your birth month, the two digits that represent your birth day, and the last four digits of the phone number most people call to reach you. If you birthday is March 5 (03/05) and your phone number is 555-555-1212, then your ID number would be 03051212.

Please enter your ID number here: _____

[It is possible to use the student's name instead of an ID number as long as any results reported publicly do not identify the student. In any case, the pre-ID and the post-ID need to be identical to match responses.]

What grade are you in?

- ○ Grade 6
- ○ Grade 7
- ○ Grade 8
- ○ Grade 9
- ○ Grade 10
- ○ Grade 11
- ○ Grade 12

[These types of demographic data can help you make sense of your data. Do older students have different results than younger ones?]

Are you ....

- ○ Male
- ○ Female
- ○ I prefer not to answer

[Demographic data like this also help you describe who your participants and respondents are!]

How sure are you that you know what a watershed is?
- Not at all sure
- A little sure
- Very sure
- I'm positive

Which of these is the best definition of a watershed?
- A building at a water treatment plant
- An area of land that drains into a specific body of water [correct answer]
- A significant pollution event
- Another name for a river or stream
- Don't know

[For subsequent analyses, treat "Don't know" as a wrong answer. You can assign wrong answers the value of 0 and correct answers the value of 1 to make it easy to calculate an overall mean of correct responses.]

How sure are you that you know what groundwater is?
- Not at all sure
- A little sure
- Very Sure
- I'm positive

Watersheds contain groundwater.
- No
- Yes [correct answer]
- Don't know

Look at the picture above. Which of the following is in this river's watershed?

	No	Yes	Don't know
The red school building	❍	❍ [correct answer]	❍
The farm	❍	❍ [correct answer]	❍
The city	❍	❍ [correct answer]	❍
The small creek on the right	❍	❍ [correct answer]	❍

Now you're going to answer some questions about local bodies of water. Examples of local bodies of water are streams, rivers, lakes, bays, and the ocean.

How much do you agree or disagree with these statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I like to learn about a local body of water	❍	❍	❍	❍	❍
I search for information to learn about a local body of water	❍	❍	❍	❍	❍
I want to explore a local body of water	❍	❍	❍	❍	❍
I care about a local body of water	❍	❍	❍	❍	❍

[This set of items is considered to be a scale for measuring the outcome Caring about Water, so you want to be sure to include them all to measure that outcome.]

For each statement, mark a response to "I know how to..." and a response to "Within the next year, I plan to..."

	I know how to…					Within the next year, I plan to …		
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	No	Yes	Not sure
Help clean up or take care of a local stream, river, or beach	❍	❍	❍	❍	❍	❍	❍	❍
Participate in a restoration activity such as planting trees or removing invasive plants	❍	❍	❍	❍	❍	❍	❍	❍
Tell others about ways they can protect a local body of water	❍	❍	❍	❍	❍	❍	❍	❍
Create a schoolyard or backyard habitat	❍	❍	❍	❍	❍	❍	❍	❍
Conserve water at home or school	❍	❍	❍	❍	❍	❍	❍	❍
Install a rain barrel at home	❍	❍	❍	❍	❍	❍	❍	❍
Give a presentation about a local body of water	❍	❍	❍	❍	❍	❍	❍	❍

[When you use a Likert-type response scale like this, assign the response values as 1-5 where 1=strongly disagree, 2=disagree, etc. to subsequently calculate an overall pre- and post-MWEE mean (i.e., the mean of the means of the measures in the scale)]

[add post-test-only items here when creating the post-test]

Thank you for completing this questionnaire!

Post-only items that describe the student's MWEE experience:

Did you learn during this school year about a local body of water and the land that drains into it?
- No
- Yes
- Not sure

[Unless they say yes, they may not have participated in the MWEE, so you will want to exclude their responses.]

(If yes) When you learned about a local body of water and the land that drains into it, did you go outside?
- No
- Yes
- Not sure

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I liked learning about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍
It was fun to learn about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍
I liked to do the things we did outside while we were learning about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍
I wish we would have spent more time learning about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍

[These satisfaction questions can help explain outcome results. If students did not like their MWEE experience, they may be less likely to show gains in outcomes.]

Appendix B: NOAA B-WET MWEE Student Questionnaire Item Bank

Please use the following reference, if you plan to use this resource:

Zint, M. and A. Kraemer. 2012. NOAA B-WET Evaluation System Plan: Student Item Bank. Bay Watershed Education and Training Program, National Oceanic and Atmospheric Administration, Washington, D.C.

For more information contact: Bronwen Rice (bronwen.rice@noaa.gov) or Michaela Zint (zintmich@umich.edu)

ENVIRONMENTAL STEWARDSHIP AND SCIENCE LEARNING OUTCOMES
SECONDARY STUDENT ITEMS

Pre/Post Matching Code

Assign each student a unique code for matching pre- and post-tests.

ENVIRONMENTAL STEWARDSHIP OUTCOMES

Connection with Nature

How much do you agree or disagree with these statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I like being in nature	❍	❍	❍	❍	❍
I like to play outdoors	❍	❍	❍	❍	❍
I like to spend time outdoors	❍	❍	❍	❍	❍
I like sitting in sand	❍	❍	❍	❍	❍
I like sitting in grass	❍	❍	❍	❍	❍
I'm OK with getting my hands dirty	❍	❍	❍	❍	❍
I'm OK with sticking my hand in river water	❍	❍	❍	❍	❍
I'm OK with stepping in mud	❍	❍	❍	❍	❍
I like to touch water insects	❍	❍	❍	❍	❍
I like to touch living fish	❍	❍	❍	❍	❍
I like to touch plants in a stream, pond, lake or the ocean	❍	❍	❍	❍	❍
Walking through a creek sounds like fun	❍	❍	❍	❍	❍
Picking through algae from a pond sounds like fun	❍	❍	❍	❍	❍

Connection to Water

Now you're going to answer some questions about local bodies of water. Examples of local bodies of water are streams, rivers, lakes, bays, and the ocean.

How much do you agree or disagree with these statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I like to learn about a local body of water	❍	❍	❍	❍	❍
I search for information to learn about a local body of water	❍	❍	❍	❍	❍
I want to explore a local body of water	❍	❍	❍	❍	❍
I care about a local body of water	❍	❍	❍	❍	❍

Water Conservation Behaviors

Choose one answer for each statement.

	No	Yes	Not sure
To conserve water, I would be willing to use less water when I shower or take a bath	❍	❍	❍
To conserve water, I turn off the water while I was my hands	❍	❍	❍
To conserve water, I turn off the water while I brush my teeth	❍	❍	❍

Knowledge of Actions and Intention to Act

For each statement, mark a response to "I know how to..." and a response to "Within the next year, I plan to..."

	I know how to…					Within the next year, I plan to …		
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	No	Yes	Not sure
Help clean up or take care of a local stream, river, or beach	❍	❍	❍	❍	❍	❍	❍	❍
Participate in a restoration activity such as planting trees or removing invasive plants	❍	❍	❍	❍	❍	❍	❍	❍
Tell others about ways they can protect a local body of water	❍	❍	❍	❍	❍	❍	❍	❍
Create a schoolyard or backyard habitat	❍	❍	❍	❍	❍	❍	❍	❍
Conserve water at home or school	❍	❍	❍	❍	❍	❍	❍	❍
Install a rain barrel at home	❍	❍	❍	❍	❍	❍	❍	❍
Give a presentation about a local body of water	❍	❍	❍	❍	❍	❍	❍	❍

Knowledge of Issues

How much do you know about ..... ?

	Nothing	A little	A lot	Not sure
The loss of forests and other plants along streams and rivers	❍	❍	❍	❍
High levels of nutrients in water and where they come from	❍	❍	❍	❍
The loss of important habitats such as wetlands and underwater plants	❍	❍	❍	❍
High levels of sediment (soil) in the water and where it comes from	❍	❍	❍	❍

Locus of Control

How much do you agree or disagree with these statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
By working on my own, I can make a difference in solving environmental problems at my school	❍	❍	❍	❍	❍
By working on my own, I can help protect the environment	❍	❍	❍	❍	❍
There are things I can do that will protect the environment	❍	❍	❍	❍	❍
By working with others, I can make a difference in solving environmental problems at my school	❍	❍	❍	❍	❍
By working with others, I can help protect the environment	❍	❍	❍	❍	❍
If everyone does their part, we can protect the environment	❍	❍	❍	❍	❍
My community can make a difference in protecting the environment	❍	❍	❍	❍	❍

SCIENCE LEARNING OUTCOMES

Science Inquiry Skills

Do you know how to ....

	No	Yes	Not sure
Create science questions that you could answer by collecting data (measurements)?	❍	❍	❍
Make predictions or hypotheses?	❍	❍	❍
Collect data (measurements) or use data collected by someone else?	❍	❍	❍
Analyze the data and figure out what it means?	❍	❍	❍
Make conclusions about what you found out?	❍	❍	❍
Present to others what you found out about your science question?	❍	❍	❍

Science Engagement

How much do you agree or disagree with these statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I usually do well in science	❍	❍	❍	❍	❍
I would like to take more science in school	❍	❍	❍	❍	❍
I enjoy learning science	❍	❍	❍	❍	❍
I learn things easily in science	❍	❍	❍	❍	❍
I would like a job that involves using science	❍	❍	❍	❍	❍
I need to do well in science to get the job I want	❍	❍	❍	❍	❍

POST-TEST ONLY!

Branching Questions
Did you learn during this school year about a local body of water and the land that drains into it?
❍ No
❍ Yes
❍ Not sure
If responded Yes to "Did you learn during this school year about a local body of water and the land that drains into it?", then answer this question:
When you learned about a local body of water and the land that drains into it, did you go outside?
❍ No
❍ Yes
❍ Not sure
If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?, then answer this question:
When you went outside to learn about a local body of water and the land that drains into it, did you go out … (choose one)
❍ On the school property?
❍ To an area within walking distance of school?
❍ To an area you had to take a car or bus to get to?
If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?, then answer this question:
About how many times did you go outside during this school year to learn about a local body of water and the land that drains into it?
❍ I don't remember
❍ Once
❍ 2-5 times
❍ 6 or more times

If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?, then answer this question:

Preparation/Action/Reflection

Choose one answer for each statement.

	No	Yes	Not sure
BEFORE we went outside to learn, we talked about what we were going to do outside.	❍	❍	❍
What we learned about local bodies of water in class was closely related to what we found out about them when we were outside.	❍	❍	❍
We learned about related science concepts BEFORE we went outside to learn about local bodies of water.	❍	❍	❍
While we were outside, I spent time collecting samples or taking measurements.	❍	❍	❍
Either outside of back in the classroom, I spent time analyzing the data or samples I collected while outside.	❍	❍	❍
While we were outside, I spent time helping to protect the area.	❍	❍	❍
Things we learned outside helped me better understand what I learned during regular science class.	❍	❍	❍
AFTER we had gone outside, I had a chance to talk with my teacher and other students about what we did and learned.	❍	❍	❍

If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?, then answer this question:

Satisfaction

How much do you agree or disagree with these statements?

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I liked learning about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍
It was fun to learn about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍
I liked to do the things we did outside while we were learning about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍
I wish we would have spent more time learning about a local body of water and the land that drains into it.	❍	❍	❍	❍	❍

Demographics
What grade are you in? (please check one)
❍ Grade 6
❍ Grade 7
❍ Grade 8
❍ Grade 9
❍ Grade 10
❍ Grade 11
❍ Grade 12

In science, do you usually get...
❍ Mostly A's?
❍ Mostly B's?
❍ Mostly C's?
❍ Mostly D's or below?
❍ Our school does not give this type of grades
❍ I prefer not to answer

Do you identify as (check all that apply):
❑ Hispanic or Latino
❑ American Indian or Alaska Native
❑ Asian
❑ Black or African American
❑ Native Hawaiian or other Pacific Islander
❑ White
❑ Other
❑ I prefer not to answer

Do you mostly speak English at home?
❍ No
❍ Yes
❍ I prefer not to answer

Are you ....
❍ Male
❍ Female
❍ I prefer not to answer

ENVIRONMENTAL STEWARDSHIP AND SCIENCE LEARNING OUTCOMES
UPPER ELEMENTARY STUDENT ITEMS

Pre/Post Matching Code

Assign each student a unique code for matching pre- and post-tests.

ENVIRONMENTAL STEWARDSHIP OUTCOMES

Connection with Nature

Choose one answer for each statement.

	Not at all	A little	A lot	Not sure
I like being in nature	❍	❍	❍	❍
I like to spend time outdoors	❍	❍	❍	❍
I like sitting in sand	❍	❍	❍	❍
I like sitting in grass	❍	❍	❍	❍
I'm OK with getting my hands dirty	❍	❍	❍	❍
I'm OK with sticking my hand in river water	❍	❍	❍	❍
I'm OK with stepping in mud	❍	❍	❍	❍
I like to touch water insects	❍	❍	❍	❍
I like to touch living fish	❍	❍	❍	❍
Walking through a creek sounds like fun	❍	❍	❍	❍
Picking through algae from a pond sounds like fun	❍	❍	❍	❍

Now you're going to answer some questions about local bodies of water. Examples of local bodies of water are streams, rivers, lakes, bays, and the ocean.

Connection to Water

Choose one answer for each statement.

	Not at all	A little	A lot	Not sure
I like to learn about my local body of water	❍	❍	❍	❍
I search for information to learn about my local body of water	❍	❍	❍	❍
I want to explore my local body of water	❍	❍	❍	❍
I care about my local body of water	❍	❍	❍	❍

Water Conservation Behaviors

Choose one answer for each statement.

	No	Yes	Not sure
To conserve water, I would be willing to use less water when I shower or take a bath	❍	❍	❍
To conserve water, I turn off the water while I was my hands	❍	❍	❍
To conserve water, I turn off the water while I brush my teeth	❍	❍	❍

Knowledge of Issues

Choose one answer for each statement.

	Nothing	A little	A lot	Not sure
The loss of forests and other plants along streams and rivers	❍	❍	❍	❍
High levels of nutrients in water and where they come from	❍	❍	❍	❍
The loss of important habitats such as wetlands and underwater plants	❍	❍	❍	❍
High levels of sediment (soil) in the water and where it comes from	❍	❍	❍	❍

Intention to Act

Within the next year, I plan to ...

	No	Yes	Not sure
Help clean up or take care of a local stream, river, or beach	❍	❍	❍
Participate in a restoration activity such as planting trees or removing invasive plants	❍	❍	❍
Tell others about ways they can protect a local body of water	❍	❍	❍
Conserve water at home or school	❍	❍	❍

Locus of Control

Choose one answer for each statement.

	No	Yes	Not sure
By working on your own, do you think you can help protect a local body of water?	❍	❍	❍
By working with others, do you think you can help protect a local body of water?	❍	❍	❍

SCIENCE LEARNING OUTCOMES

Science Inquiry Skills

Do you know how to do these things?

	No	Yes	Not sure
Create science questions that you could answer by collecting data (measurements)?	❍	❍	❍
Make predictions or hypotheses?	❍	❍	❍
Collect data (measurements) or use data collected by someone else?	❍	❍	❍
Analyze the data and figure out what it means?	❍	❍	❍
Make conclusions about what you found out?	❍	❍	❍
Present to others what you found out about your science question?	❍	❍	❍

Science Engagement

Choose one answer for each statement.

	No	Yes	Not sure
I usually do well in science	❍	❍	❍
I would like to take more science in school	❍	❍	❍
I enjoy learning science	❍	❍	❍
I learn things easily in science	❍	❍	❍
I would like a job that involves using science	❍	❍	❍
I need to do well in science to get the job I want	❍	❍	❍

POST-TEST ONLY!

Branching Questions

Did you learn about a local body of water and the land that drains into it during this school year?

- ❍ No
- ❍ Yes
- ❍ Not sure

If responded Yes to "Did you learn about a local body of water and the land that drains into it during this school year?", then respond to this question:

When you learned about a local body of water and the land that drains into it, did you go outside?

- ❍ No
- ❍ Yes
- ❍ Not sure

If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?" then answer this question:

When you went outside to learn about a local body of water and the land that drains into it, did you go out … (choose one)

- ❍ On the school property
- ❍ To an area within walking distance of school
- ❍ To an area you had to take a car or bus to get to

If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?", then respond to this question:

Choose one answer for each statement.

Satisfaction

	Not at all	A little	A lot	Not sure
I liked learning about a local body of water and the land that drains into it.	❍	❍	❍	❍
It was fun to learn about a local body of water and the land that drains into it.	❍	❍	❍	❍
I liked to do the things we did outside while we were learning about a local body of water and the land that drains into it.	❍	❍	❍	❍
I wish we would have spent more time learning about a local body of water and the land that drains into it.	❍	❍	❍	❍

If responded Yes to "When you learned about a local body of water and the land that drains into it, did you go outside?", then respond to this question:

Preparation/Action/Reflection

Choose one answer for each statement.

	No	Yes	Not sure
BEFORE we went outside to learn, we talked about what we were going to do outside.	❍	❍	❍
While we were outside, I spent time collecting samples or taking measurements.	❍	❍	❍
While we were outside, I spent time helping to protect the area.	❍	❍	❍
AFTER we had gone outside, I had a chance to talk with my teacher and other students about what we did and learned.	❍	❍	❍

Demographics

What grade are you in?

- ❍ Grade PreK, 1, 2, or 3
- ❍ Grade 4
- ❍ Grade 5
- ❍ Grade 6
- ❍ Grade 7
- ❍ Grade 8
- ❍ Grade 9, 10, 11, or 12

In science, do you usually get...

- ❍ Mostly A's?
- ❍ Mostly B's?
- ❍ Mostly C's?
- ❍ Mostly D's or below?
- ❍ Our school does not give this type of grades
- ❍ I prefer not to answer

Do you identify as (check all that apply):

- ❑ Hispanic or Latino
- ❑ American Indian or Alaska Native
- ❑ Asian
- ❑ Black or African American
- ❑ Native Hawaiian or other Pacific Islander
- ❑ White
- ❑ Other
- ❑ I prefer not to answer

Do you mostly speak English at home?

- ❍ No
- ❍ Yes
- ❍ I prefer not to answer

Are you ....
❍ Male
❍ Female
❍ I prefer not to answer

WATERSHED LITERACY OUTCOMES
SECONDARY STUDENT ITEMS

Pre/Post Matching Code

Assign students a unique code for matching pre- and post-tests.

Demographics

What grade are you in?

- Grade PreK, 1, 2, or 3
- Grade 4
- Grade 5
- Grade 6
- Grade 7
- Grade 8
- Grade 9, 10, 11, or 12

In science, do you usually get...

- Mostly A's?
- Mostly B's?
- Mostly C's?
- Mostly D's or below?
- Our school does not give this type of grades
- I prefer not to answer

Do you identify as (check all that apply):

- Hispanic or Latino
- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White
- Other
- I prefer not to answer

Do you mostly speak English at home?

- No
- Yes
- I prefer not to answer

Are you ....

- Male
- Female
- I prefer not to answer

Objective 1: Define the term "watershed"

How sure are you that you know what a watershed is?

- ❍ Not at all sure
- ❍ A little sure
- ❍ Very sure
- ❍ I'm positive

Which of these is the best definition of a watershed?

- ❍ A building at a water treatment plant
- ❍ An area of land that drains into a specific body of water
- ❍ A significant pollution event
- ❍ Another name for a river or stream
- ❍ Don't know

How sure are you that you know what groundwater is?

- ❍ Not at all sure
- ❍ A little sure
- ❍ Very Sure
- ❍ I'm positive

Watersheds contain groundwater.

- ❍ No
- ❍ Yes
- ❍ Don't know

Look at the picture. Which of the following is in this river's watershed?

	No	Yes	Don't know
The red school building	❍	❍	❍
The farm	❍	❍	❍
The city	❍	❍	❍
The small creek on the right	❍	❍	❍

Objective 2: Identify their local watershed(s)

Do you live in a watershed?

- ❍ No
- ❍ Yes
- ❍ Don't know

Objective 3: Identify how watersheds are connected to the ocean via streams, rivers, and human-made structures

Where does most of the water from the land eventually end up?

- ❍ Ocean
- ❍ River
- ❍ Sewer
- ❍ Lake
- ❍ Don't know

How sure are you that you know what a storm drain is?

- ❍ Not at all sure
- ❍ A little sure
- ❍ Very sure
- ❍ I'm positive

Ultimately, where does water end up after it enters a storm drain?

- ❍ Wastewater treatment plant
- ❍ A local body of water
- ❍ In the ground
- ❍ City sewer
- ❍ Don't know

Objective 4: Identify the functions that occur in a watershed (transport, store, and cycle water)

What are some of the functions that occur within a watershed?

	No	Yes	Don't know
The transport of water	❍	❍	❍
The transport of materials, like soil through rivers	❍	❍	❍
The storage of water in lakes, rivers, groundwater, etc.	❍	❍	❍
The transformation of water from one state to another (liquid, ice, vapor, etc.)	❍	❍	❍

Objective 5: Recognize that both natural processes and human activities affect water flow and water quality in watersheds

Which of these statements is FALSE? Watershed boundaries …

- ❍ Hardly ever change; they are nearly permanent
- ❍ Can sometimes be changed by the actions of people
- ❍ Can sometimes be changed by natural processes
- ❍ Are constantly altered by both human activities and natural processes
- ❍ Don't know

Which of the following can change how water drains in a watershed?

	No	Yes	Don't know
A flood	❍	❍	❍
A landslide	❍	❍	❍
A dam	❍	❍	❍
The construction of a storm drain	❍	❍	❍

How sure are you that you know what stormwater is?

- ❍ Not at all sure
- ❍ A little sure
- ❍ Very sure
- ❍ I'm positive

Stormwater pipes are similar to streams and creeks because they both:

- ❍ Usually have greater water flow when it storms
- ❍ Are natural habitats for plants and animals
- ❍ Are constructed by people
- ❍ Usually receive most of the water from drains and ditches
- ❍ Don't know

When trees in a watershed are cut down and replaced with pavement and buildings, …

	No	Yes	Don't know
More water will drain into local rivers and lakes	❍	❍	❍
More water will drain into groundwater	❍	❍	❍
Water will drain into local rivers and lakes faster	❍	❍	❍
There will be a greater chance of flooding and erosion	❍	❍	❍

Vegetated buffers (that is, trees, shrubs, other plants along streams, rivers, and estuaries) …

- ❍ Increase flooding along streams and rivers
- ❍ Decrease erosion and filter water flowing to streams and rivers
- ❍ Increase erosion and filter run-off along streams and rivers
- ❍ Increase the nutrients that flow into water
- ❍ Don't know

Which human activities might increase water pollution?

	No	Yes	Don't know
Water running off people's yards and farm fields	❍	❍	❍
Water running off streets and parking lots	❍	❍	❍
Putting chemicals down storm drains	❍	❍	❍
Draining wetlands, such as marshes	❍	❍	❍
Removing trees and other plants	❍	❍	❍

Nutrients (such as nitrogen and phosphorus) in a stream, river, lake, or ocean can be a form of pollution.

- ❍ No
- ❍ Yes
- ❍ Don't know

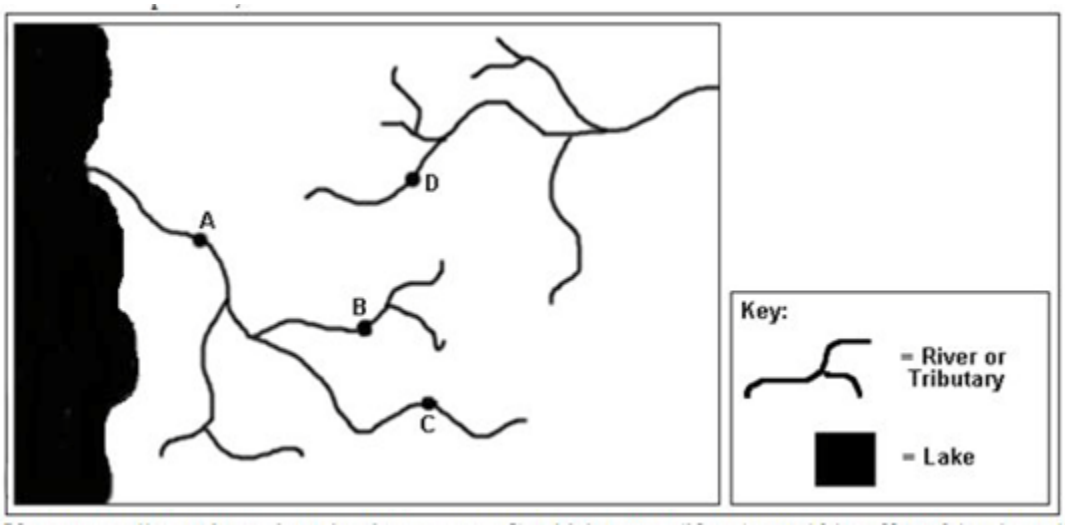
Objective 6: Identify connections between human welfare and water flow and quality

The quality of the water in rivers, lakes, and the ocean can affect the health of people living near them.

- ❍ No
- ❍ Yes
- ❍ Don't know

The water from bodies of water, such as rivers and creeks, is used ...

	No	Yes	Don't know
for drinking after it's cleaned	❍	❍	❍
for farming	❍	❍	❍
by wildlife	❍	❍	❍



If a pollutant is put into the river at Town C, which town(s) (if any) would be directly affected by the pollution? Check all that apply.

- ❑ A
- ❑ B
- ❑ C
- ❑ D

Objective 7: Identify possible point and non-point sources of water pollution

How sure are you that you know what non-point source pollution is?

- ❍ Not at all sure
- ❍ A little sure
- ❍ Very sure
- ❍ I'm positive

Which of these is a type of non-point source pollution?

	No	Yes	Don't know
Oil in the water running off of streets and parking lots	❍	❍	❍
Soil in the water running off of farm fields	❍	❍	❍
Fertilizer in the water running off of lawns	❍	❍	❍
Chemicals in the water coming out of a factory pipe	❍	❍	❍

Rivers are the major ways through which non-point source pollution enters the ocean.

- ❍ No
- ❍ Yes
- ❍ Don't know

How sure are you that you know what point source pollution is?

- ❍ Not at all sure
- ❍ A little sure
- ❍ Very sure
- ❍ I'm positive

Controlling point source pollution is typically easier than controlling non-point source pollution.

- ❍ No
- ❍ Yes
- ❍ Don't know

Objective 8: Identify actions individuals can engage in to protect/restore water quality in watersheds

Which of the following would help keep water clean?

- ❍ Disposing of household chemicals down the drain
- ❍ Washing the car on the grass instead of on pavement
- ❍ Leaving the water running while brushing teeth
- ❍ Cutting down native trees in the woods
- ❍ Don't know

People can help protect the water in their local watershed by:

	No	Yes	Not sure
Conserve water at home or school	❍	❍	❍
Help clean up or take care of a local stream, river, or beach	❍	❍	❍
Participate in a restoration activity such as planting trees or removing invasive plants	❍	❍	❍